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THE SCALES OF THE ATHERINID FISHES.

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When examining the scales of various Acanthopterygians, it was observed that those of the Scombrids differed so greatly from those of the Percoids that it was hard to understand how one could have been derived from the other. The typical Percoid scale (e. g. that of *Perca fluviatilis*) has very strong basal radii, the inferior margin being scalloped or crenulate. Scales of this type may be cycloid or etenoid, but their general character remains the same. In *Scomber* the broad scale has no basal radii whatever, and the lower margin is not scalloped. It chanced that among some fishes of unknown locality, long preserved at the University of Colorado, I found a couple of Atherinidæ. The examination of their scales at once revealed the fact that they were (in respect to the squamation) exactly intermediate between the Scombrids and Percoids; in fact the different scales on the same fish virtually bridged the gap which had seemed so great. Through the kindness of Dr. Evermann and the Bureau of Fisheries, I have now been supplied with four species of Atherinidæ, having authentic names and localities, and it seems worth while to report the results of their examination. The Atherinid scale (from the middle of the side) is broader than long, and in general very much like that of the Scombrids. In *Kirtlandia laciniata* the scales from the position mentioned have no basal radii, although the base is wavy or subplicate; but the scales of the caudal peduncle show strong basal radii. The diagnostic characters are as follows:

- (1.) *Kirtlandia laciniata* Swain. Chesapeake Bay, Va. (Grampus Sta. 4). Scales nearly 3 mm. long, a little over 4 broad: apical margin thin, strongly irregularly crenate, with rudimentary radii; apical

field without circuli; basal and lateral fields with strong circuli, not very dense (least so laterally); basal margin with a prominent median lobe, bounded on each side by a shallow fold, but no basal radii. Scales of caudal peduncle similar but nearly square, with strong laterobasal angles, and five strong basal radii. The scales are very suggestive of those of *Scomber chrysozonus* (probably better called *Rastrelliger chrysozonus*, as I learn from Dr. Jordan), but the latter has no basal lobe, and has strong transverse circuli in the apical field. In general, however, the resemblance is most striking.

- (2.) *Menidia menidia* (L.). Cape Charles City, Va., above mouth of King's Creek. Scales (from the usual situation on middle of side) about $2\frac{3}{4}$ mm. long and $3\frac{1}{3}$ broad; nucleus central; apical margin simple, entire; no apical radii; apical field with dense rather ill-defined circuli; lateral field with widely spaced circuli; basal field with strong circuli and 8 or 9 strong radii, which, however, do not nearly reach the margin; basal lobe slightly indicated. Scales from caudal peduncle nearly square with strong posterior corners and numerous strong basal radii.
- (3.) *Menidia notata* (Mitch.). Wareham River, Mass., practically in fresh water. Scales hardly 2 mm. long, about $2\frac{1}{4}$ broad; formed as in *M. menidia*, except that there are about 8 strong basal radii, which reach the margin, producing the characteristic scalloping. Scale from caudal peduncle differing as in the others.
- (4.) *Menidia peninsulæ* (Goode and Bean). Sebastian River, Fla. (Pelican Islands). Scales about 2 mm. long and $2\frac{3}{4}$ broad; structure as in the other species of *Menidia*, except that the basal radii (7 or 8), while reaching the margin, which they irregularly scallop, fail centrally, being in general less well developed than those of *M. notata*. Scale from caudal peduncle differing as in the others.

Kirtlandia and *Menidia* offer excellent generic differences in their scales; *Kirtlandia* is, of course, the more *Scomber*-like.

The Atherinidæ belong to the Percesoces, a suborder of which Jordan and Evermann say: "The suborder marks a transition from soft-rayed to spiny-rayed fishes, its nearest associates among the latter being, perhaps, the Scombrid forms." The Scombriform character of the scales, with a combination of Perciform features, is therefore of much interest.